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INCOSE Webinar Series

Monday 19 June 2017 – Webinar 100!

Integrating Program Management and Systems Engineering

Randall Iliff, Eric Rebentisch & Stephen Townsend

INCOSE is offering Webinars …

- To provide a forum for experts in the field of Systems Engineering to present information on the "State of the Art"
- To explain how INCOSE works, and how to make the most out of INCOSE membership

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- **8-9 am (EDT): ID# INCE1061917**
- **7-8 pm(EDT): ID# INCE2061917**

Choreography

1. Andy Pickard (your host) will introduce the Webinar and the speakers
2. Randy, Eric and Stephen will speak for about 40 to 45 minutes
3. During their talk, participants can write questions using the Webex Q&A window
4. After Randy, Eric and Stephen complete their talk, they will spend 10 minutes answering questions that they select from those submitted by the audience
5. Andy Pickard will provide information about upcoming Webinars and then end this session
6. This Webinar is being recorded and will be made available on the INCOSE website to members and employees of CAB organizations

Integrating Program Management and Systems Engineering

About the Speakers

Randall C. Iliff

Founder and Principal, Eclectic Intellect, LLC

Co-Leader, PMI-INCOSE-MIT Alliance Team (INCOSE)

Eric S. Rebentisch

Lead Researcher, MIT Consortium for Engineering Program Excellence (CEPE)

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PMI Director for Network Programs

Co-Leader, PMI-INCOSE-MIT Alliance Team (PMI)

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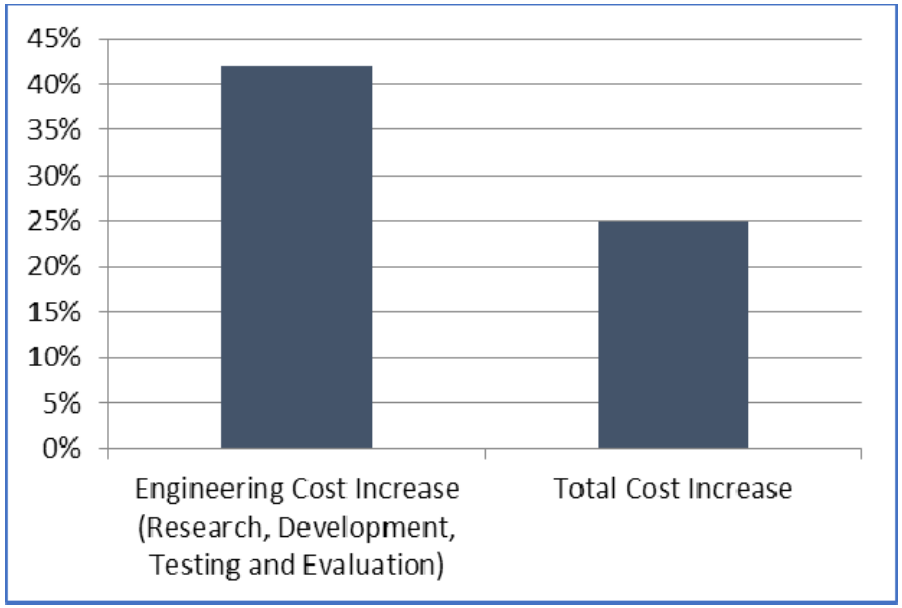
Integrating Program Management and Systems Engineering

Methods, Tools, and Organizational Systems for Improving Performance

Large-scale engineering programs often exhibit disappointing outcomes

US Department of Defense Development Portfolio – Change from initial estimate (2008)

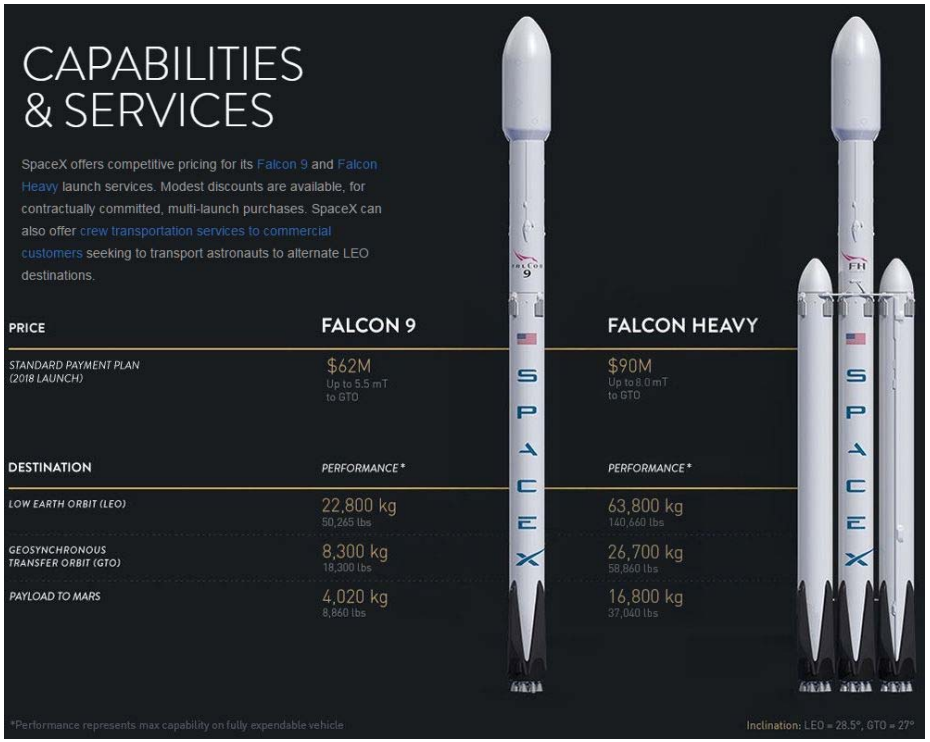


- Total cost growth: **$296 billion**
- Average schedule overrun: **22 months**
- Similar situation in other industries

Source: Oehmen (2012)

SpaceX: a high-performance organization with complex products

Photo by John Schreiber, http://mynewsla.com/business/2016/04/08



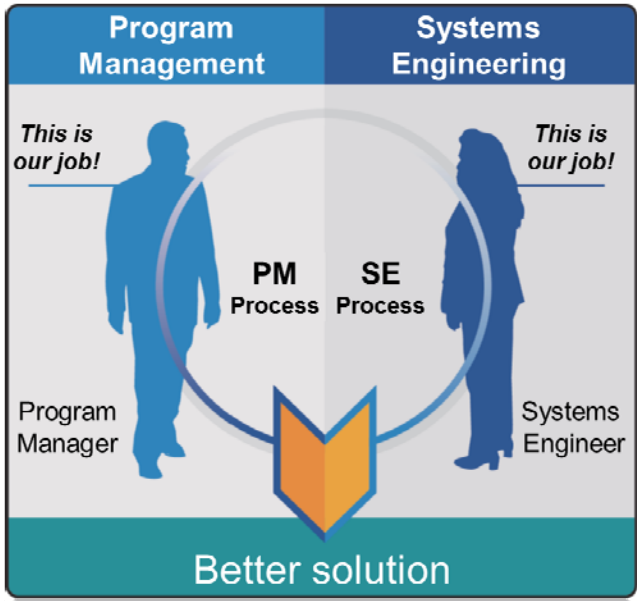
Source: SpaceX

Practices contributing to its success:

- Focus on simplicity in the design
- Colocation
- Vertical integration
- Mission assurance embedded in routine operations
- Culture

Vision: Toward a new mindset of integrated Program Management and Systems Engineering disciplines

- Current state: "*…some systems engineers and program managers have developed the mindset that their work activities are separate from each other rather than part of the organic whole…*"
- Result: routine failure of complex and large-scale engineering programs to meet cost budgets, schedule, and requirements
- Vision: "*…an understanding that all of the work is relevant to both groups, and that the delivery of stakeholder value requires an appropriate contribution from both areas of professional expertise.*"



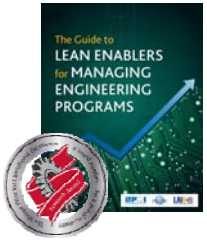
Source: PMI

Source: Langley, M., Robitaille, S., & Thomas, J. (2011)

An alliance built around addressing important engineering program challenges

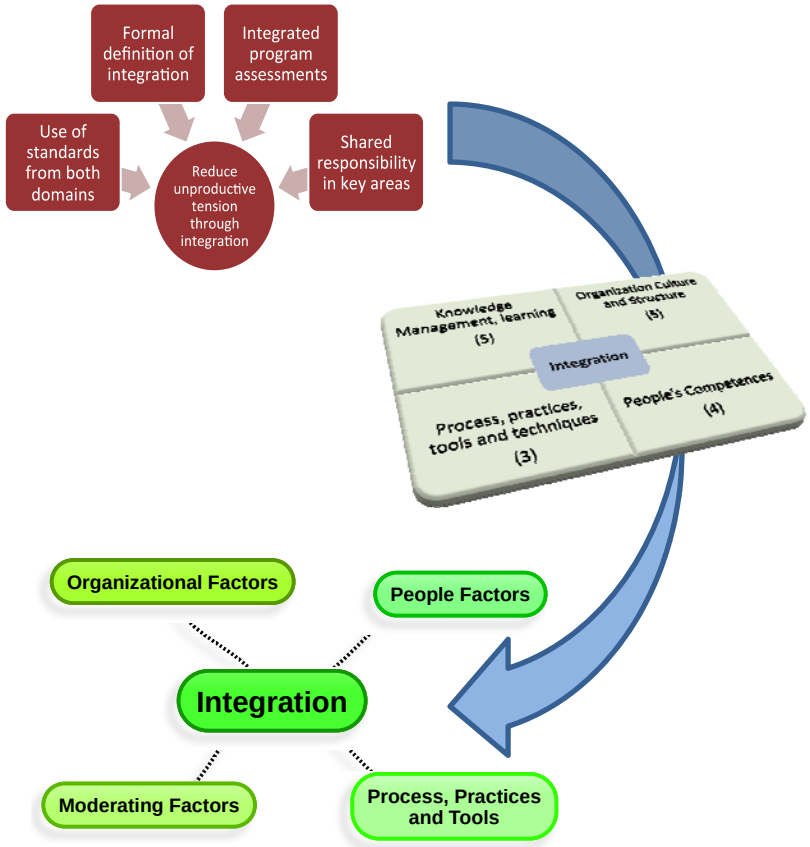
- 2011: The Project Management Institute (PMI) and International Council on Systems Engineering (INCOSE) formed a strategic alliance to advance the integration of the systems engineering and program management disciplines.
- 2011: PMI and INCOSE jointly publish “Toward a new mindset: Bridging the gap between program management and systems engineering” in *PM Network.*

- 2011: MIT gathered researchers and industrial partners (many were members of PMI and INCOSE) to explore application of Lean principles in program management, eventually forming the Consortium for Engineering Program Excellence (CEPE).
- 2012: First result of the collaboration between MIT, PMI, and INCOSE is the Shingo prize-winning *The Guide to Lean Enablers for Managing Engineering Programs* (Oehmen, 2012).



The research objective: to characterize the integration of the Program Management and Systems Engineering disciplines

- Motivation: Improving performance of complex and large-scale engineering programs can potentially have societal-level impact
- Joint PMI/INCOSE survey (2012) and subsequent interviews with subject matter experts laid foundation for follow-up studies
- Weak integration between Program Management and Systems Engineering leads to unproductive tension in organizations
- Objective: Better understand the methods and impact of integration between PM and SE



Unproductive tension results from…

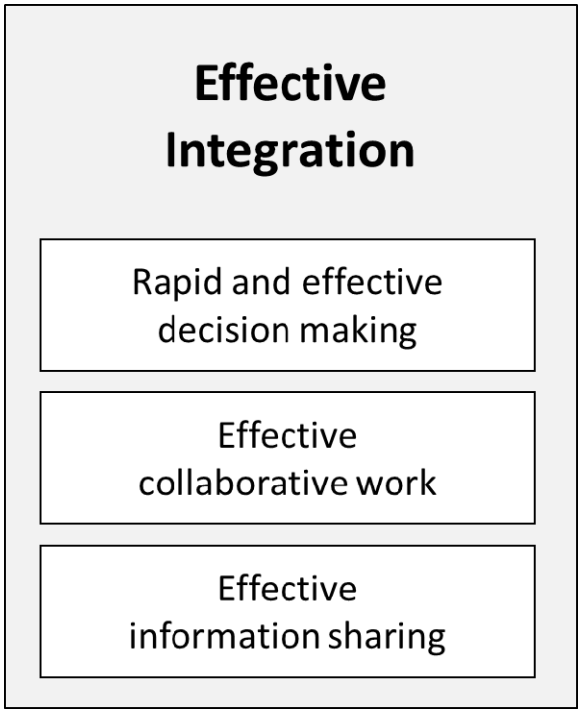
- Failing to communicate and establish a common set of objectives “vision” shared by all…
- Individuals/groups focusing on achieving objectives defined by their own discipline identity and/or processes…
- Being unable to work together to achieve the globally-superior outcome…
- Not valuing the others’ role and contributions to achieving the globally-superior outcome…

Integration is…

- Having a shared set of objectives defined by the success of the overall effort…
- Everyone knowing what those objectives are…
- Clarity and understanding around everyone's roles and how they contribute to achieving the objectives…
- Respecting the value of the others' role and contribution to achieving the objectives…
- Valuing and promoting "collaboration" over "competition"…

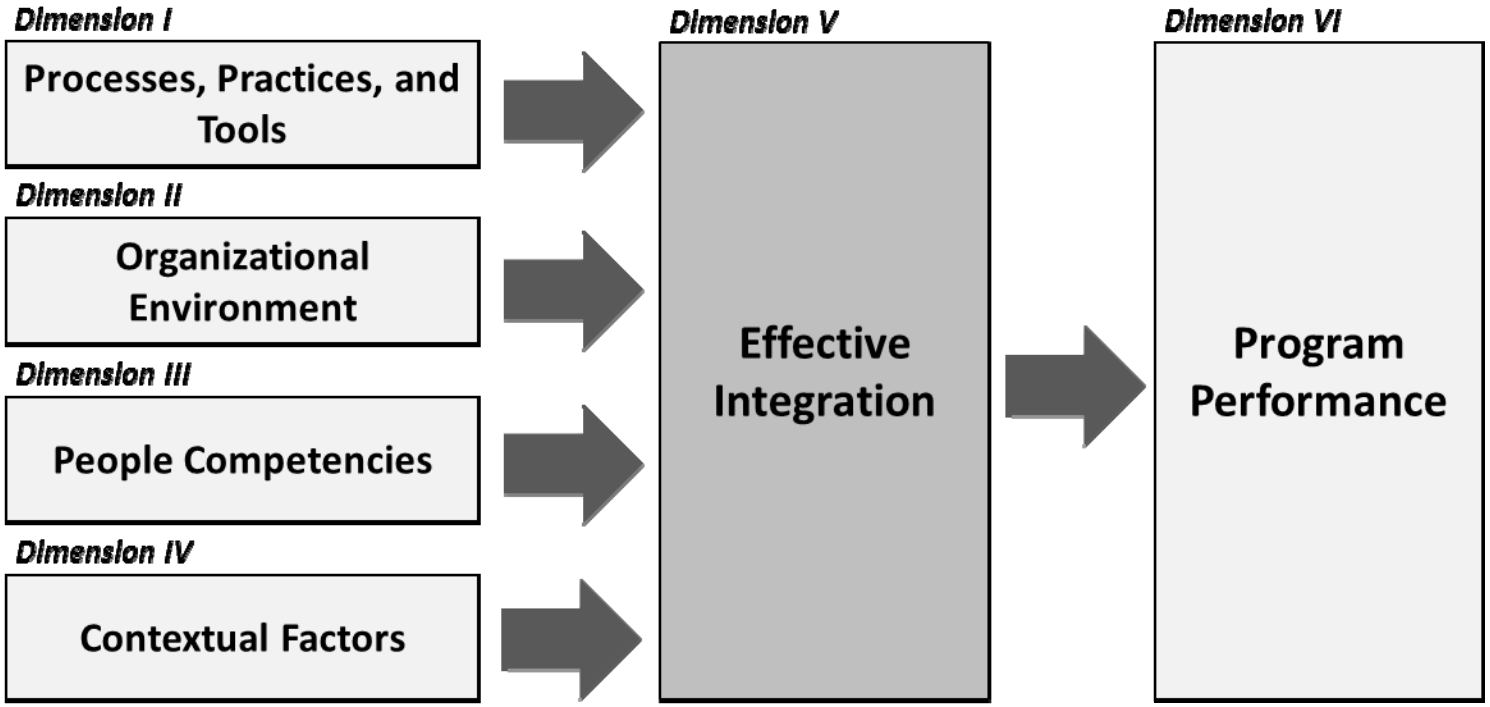
Integration as a characteristic of the organization

Integration is a reflection of the organization's ability to combine program management and systems engineering practices, tools and techniques, experience, and knowledge in a collaborative and systematic approach in the face of different challenges, in order to be more effective in achieving a common goal/objective in complex program development environments.



Source: Rebentisch et al (2017)

A system view of PM/SE integration

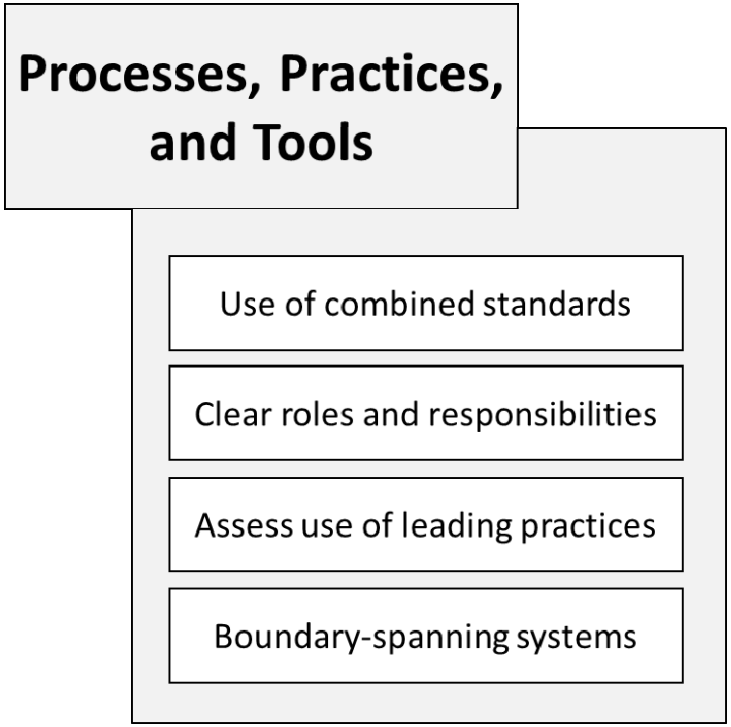


Source: Rebentisch et al (2017)

Processes, Practices, and Tools

Processes, practices, and tools help to enable integration by:

- Enabling communication and common understanding
- Defining specific work activities
- Establishing expectations of each person's contribution
- Documenting approaches for coordinating and tracking work efforts
- Identifying critical points where individual and group work efforts must come together
- Facilitating problem identification and resolution
- Applying and updating best practices
- Supporting and improving specific work activities



Source: Rebentisch et al (2017)

Organizational Environment

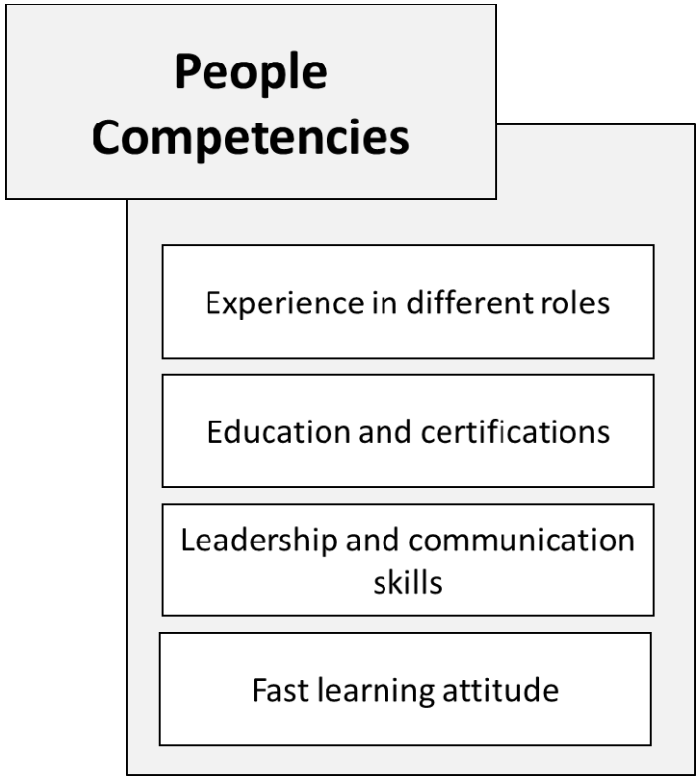
- Organizational structures, behaviors, and norms shape how program participants work and interact with each other, and determine the nature of relationships
- An integrated program environment should:
  - Narrow the cultural divide between PM and SE disciplines
  - Foster team building
  - Develop respect for each-others' views and opinions
  - Build trust between executive management and program teams

Source: Rebentisch et al (2017)

Developing Integration Competencies in People

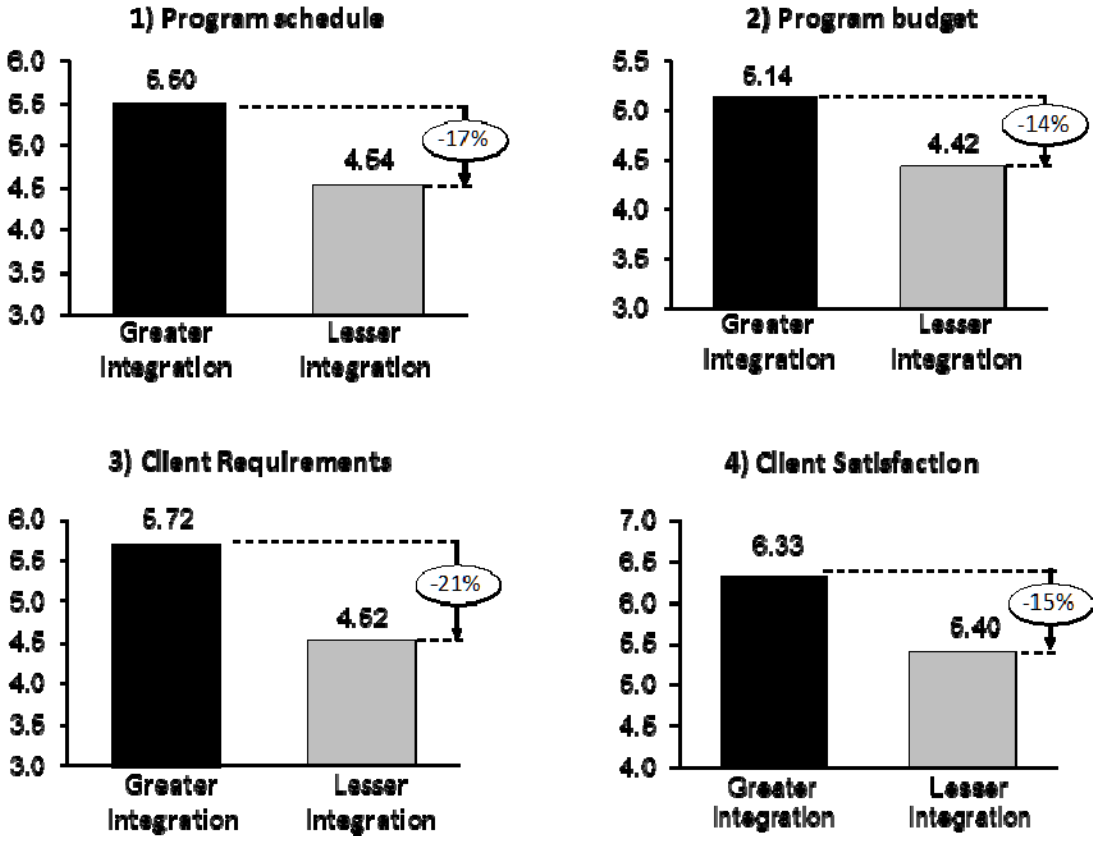
Organizations develop integration competencies in people by:

- Defining integration competencies using, e.g., standards, role definitions, and assessments
- Using education and training to develop integration competencies and teaming behaviors
- Managing integration competencies in the workforce at the individual and organizational levels



Source: Rebentisch et al (2017)

Integration improves delivery of program outcomes



Global survey, N=157

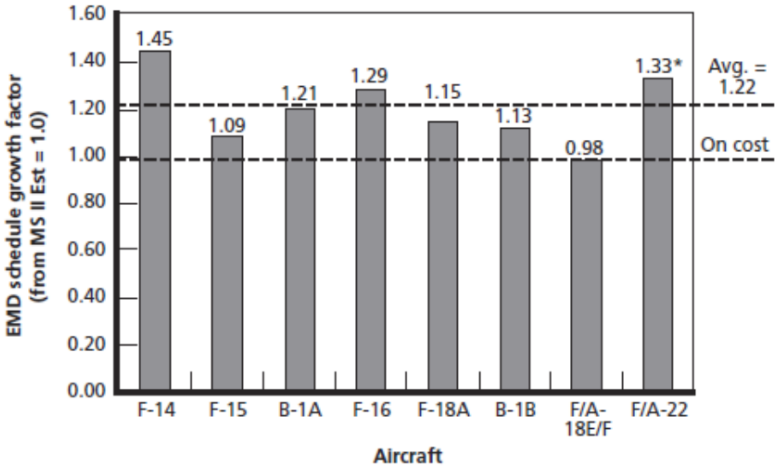
Source: Reiner, 2015

F/A-18E/F Super Hornet—a highly- integrated program

Integration Practices	
Integration Processes, Practices, and Tools • WBS based on the product architecture • Common central database with weekly reporting • WBS linked to EVMS • Flow-down budgets to the IPTs	**Organizational Environment** • Leadership at all levels modeled integrated behavior • IPTs bridged functional groups • Emphasized effective communication across functional boundaries • Culture of shared responsibility for outcomes
People Competencies • Develop integration competencies • Leaders selected on experience and ability to foster relationships • Decisions made by capable people where work is performed	**Contextual Factors** • Urgent replacement needed • Program budget was fixed • Complexity reduced using derivative product strategy and existing relationships • Mature technologies limited overall program scope

Source: Rebentisch et al (2017)

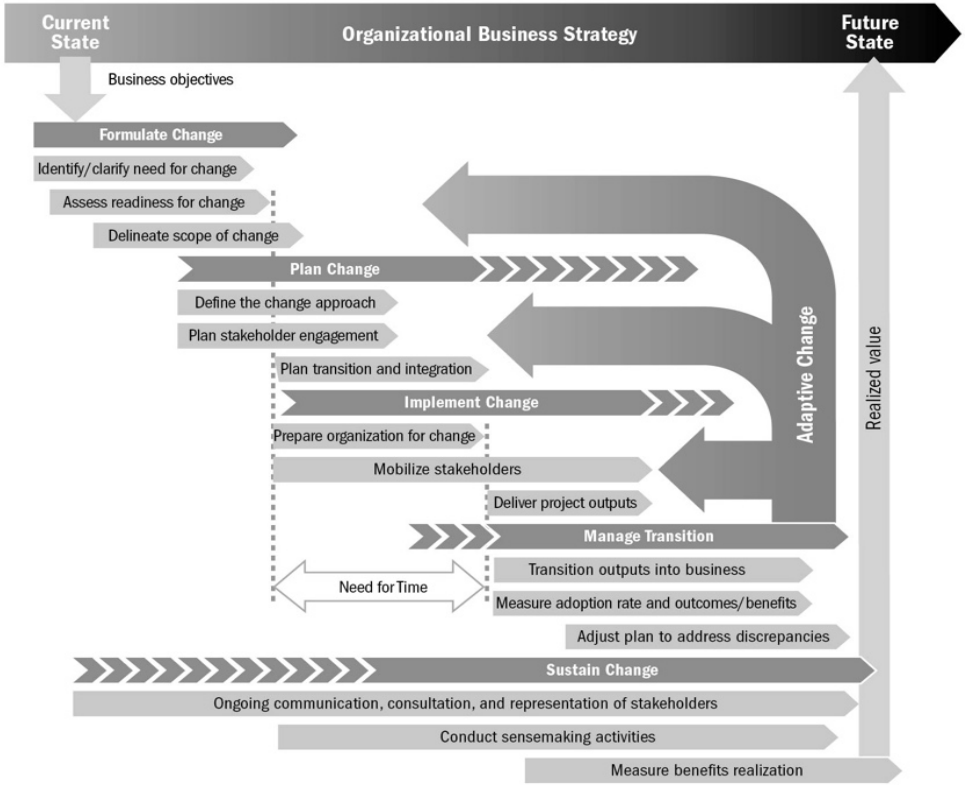
Source: US Navy



Source: Younossi et al (2005)

Increasing integration between PM and SE in organizations will require change

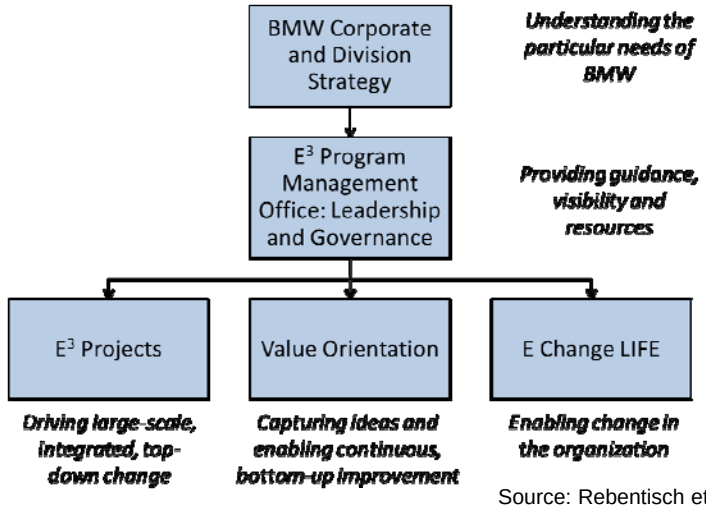
- Developing greater levels of integration will require organizations to change
- Most organizations will require concerted, deliberate, and sustained effort to effectively implement and manage the change
- Such change will typically involve:
  - Strategic Phase
  - Readiness Assessment
  - Planning Phase
  - Execution Phase



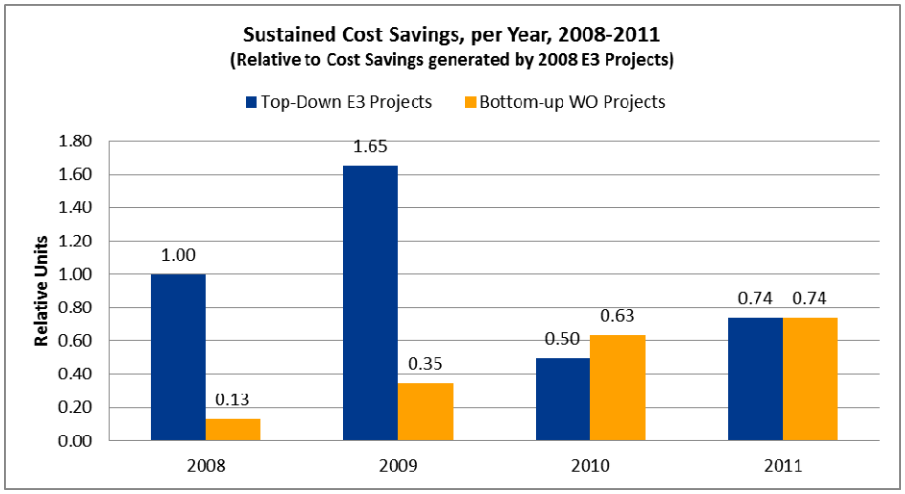
Source: PMI (2013)

Change in the BMW Engineering Division

- Strategic imperative to improve engineering productivity within 5 years
- E^3 Program was established to transform the E-Division:
  - Exhilarating products; Efficient processes and structures; Emotions and team spirit
- System approach to change:
  - Senior leaders provided the vision and resources, were personally involved in deploying the change
  - The company and division strategy were communicated to all employees by leaders
  - Project management organization (PMO) managed the change program, provided resources, change tools, and expert coaches
  - Projects included both top-down and bottom-up change initiatives to engage the entire workforce
  - The scope of changes addressed product, processes, tools, communication, leadership, and culture



Source: Rebentisch et al (2017)



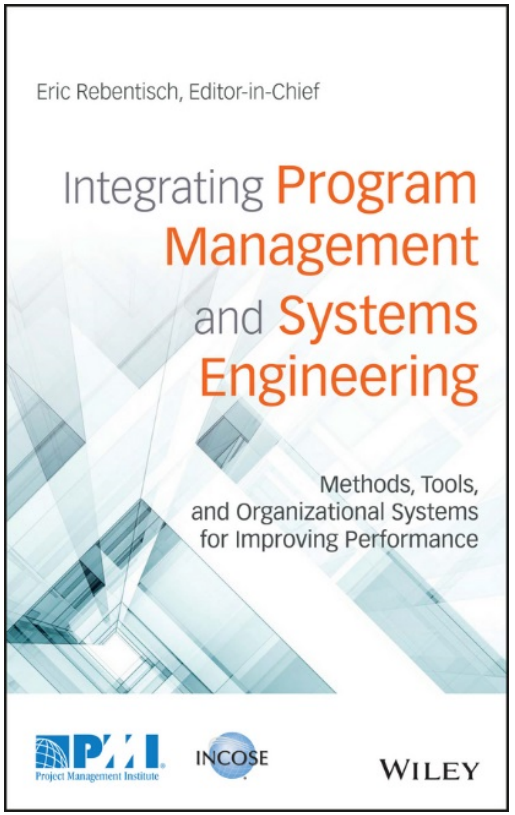
Source: Rebentisch et al (2017)

Building momentum in the promotion of integration between PM and SE disciplines

- 2013: The First phase of the PM/SE Integration study released at INCOSE IS and PMI Congress
- 2014: Second and Third research phases completed, PM-SE Integration Community launched on LinkedIn
- 2015: Alliance working meetings at INCOSE IW, PMI Headquarters in April. Book proposal prepared and submitted
- 2016: Alliance completed and submitted manuscript to Wiley, INCOSE PM–SE WG established to support worldwide interest in PM and SE integration
- 2017: Alliance focus on book promotion and follow-on activity. INCOSE PM-SE Co-Chairs Jean-Claude Roussel, Gary Smith, and Tina Srivastava working to launch WG

A path-breaking new resource to help improve engineering program performance outcomes

- Main message:
  - Tighter integration between program managers and systems engineers leads to high-performing programs
  - A system approach to combining methods, tools, and organizational systems provides the key to success
- Primary audience:
  - Systems engineering, project/program management, and process improvement practitioners working in government and corporations
  - Graduate programs teaching project/program management and systems engineering
- Published by John Wiley & Sons (ISBN 978-1-119-25892-6) in February 2017



Editors and contributors combine practical experience and insights with theory

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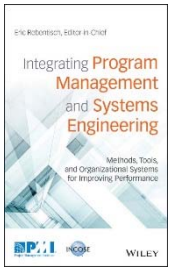
- Stanley I. Weiss (consulting professor)
- Thomas Paider (Nationwide Mutual Insurance Company)
- Timothy Wiseley (Sandia National Lab)

Resources to help your PM SE integration journey

- **"Integrating Program Management and Systems Engineering"** (2017), John Wiley & Sons.

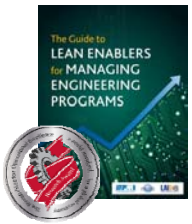


- **Program Management/Systems Engineering (PM/SE) Integration Community** on LinkedIn.

- PMI community website… (coming soon)

- INCOSE PM-SE working group website… (coming soon)

- "**The Guide to Lean Enablers for Managing Engineering Programs**"—2013 Shingo Research and Professional Publication Award recipient. Download the e-book at http://cepe.mit.edu.



2017 calendar of PM SE integration-related events

April 26-27	Naval Postgraduate School Acquisition Research Symposium	Monterey CA USA
May 20-23	Institute of Industrial and Systems Engineers (IISE) Annual Conference	Pittsburgh PA USA
May 29-31	South European Systems Engineering tour (SESE) 2017 AEIS-INCOSE	Paris, Rome, Madrid
June 25-28	American Society for Engineering Education (ASEE) Annual Conference	Columbus, OH USA
July 15-20	INCOSE IS	Adelaide, Australia
August	CPM/NDIA Integrated Program Management Conference	
September18-21	European Society for Engineering Education (SEFI) Conference	Azores, Portugal
September 27	PMI Virtual Conference on Integrating Program Management and Systems Engineering	Online – details forthcoming

References

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Younossi, O., Stem, D., Lorell, M., & Lussier, F. (2005). *Lessons learned from the F/A–22 and F/A–18E/F development programs*. Rand Corporation. Report MG-276. ISBN 0-8330-3749-8.

Thank you for participating!
Questions?

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Founder and Principal,
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Lead Researcher, MIT Consortium for Engineering Program Excellence (CEPE)

Stephen Townsend

PMI Director for Network Programs

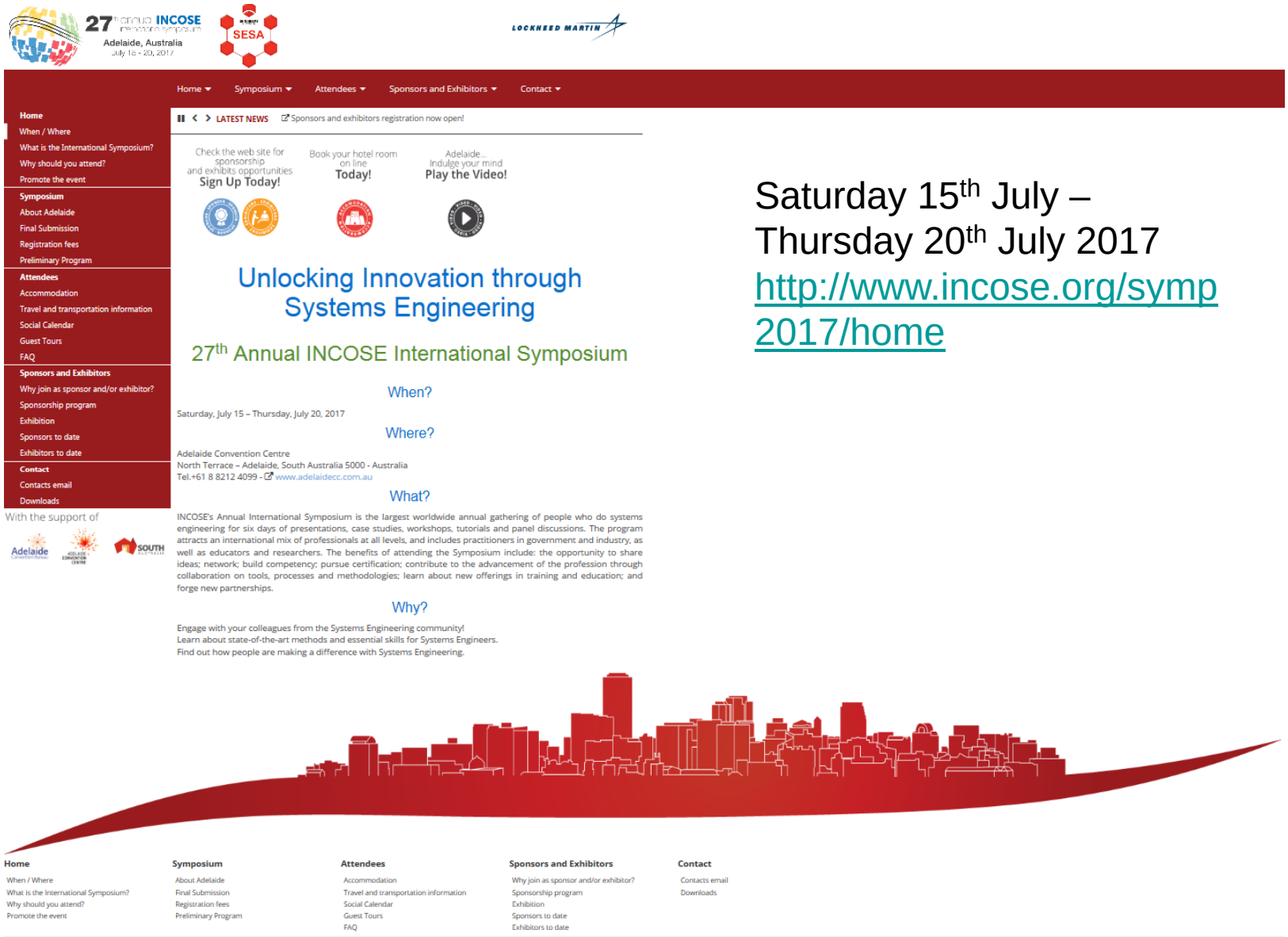
Upcoming Webinars (tentative schedule)

Who	What	When
Jaci Pratt	System of Systems	June 21st 2017 at TBD
Paul Clements	Feature-based Product Line Engineering: ISO Standards Initiative and Recent Industry Experience	August 2nd 2017 at 11am EDT

Invitations will be emailed in advance and informational updates will be placed on www.incose.org
Go to http://www.incose.org/ProductsPublications/webinars for more info on the webinar series, including a way to view the last Webinar and soon – this one!

Information on the webinars is now being posted in INCOSE Connect, in the INCOSE Library area, at https://connect.incose.org/Library/Webinars/Pages/INCOSE-Webinars.aspx . Joining instructions will added around two weeks before the webinar is scheduled to take place.

INCOSE IS2017 – Adelaide, Australia



Saturday 15th July – Thursday 20th July 2017
http://www.incose.org/symp2017/home

INCOSE GLRC11 – Twin Cities, Minnesota

11 – 14 October 2017
Submission Deadline:
27 May 2017
www.incose.org/glrc11

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